

Amendments

Claims 1 and 6 have been amended to recite the segment as having an inner face (205) and an outer face (206) on which a T-shaped extension (209a/b, 211; see top of page 8 of the specification) is supported. Accordingly, as now claimed, the lower member on which the fins and brush seal are supported as well as the upper T-shaped extension span the same "side ends" and end at the same plane. No new matter is added.

Rejection under 35 USC 102

The rejection hereunder over Bagepalli is respectfully rejected in light of the amendments and the following remarks.

As now amended, claims 1 and 6 require that the corresponding portions of the inventive seal segment be disposed to end at the same side end, and so there is no overlap or circumferential displacement of the T-shaped extension on the outer face from the inner face. This does not mean that the side end cannot be angled circumferentially with respect to the radii, which are technically at 90° to the central axis. What it means is that the entire "side end" of the segment ends in one plane, and so that adjacent segments meet in a plane, whereby it is possible for the segments to move radially outward.

Bagepalli discloses a "mounting block" (30) having ends that are circumferentially displaced (column 2, lines 3-12) from the labyrinth seal segments on the inner, sealing portion.

The allegation in the final rejection that segmentation of the seal inherently leads to the ability to retract is vigorously traversed. All seals are segmented for this type of machine because that is the only way they could be replaced without totally dismantling the device. Steam turbines can be as long as the length of a city block. It would be impossible to replace a seal that was not segmented without dismantling the entire casing and removing the shaft. And then how is the shaft to be supported while slipping an unsegmented seal by the support means? With a segmented seal, only the overlying portion of the casing needs to be removed and the seal segments can be removed and replaced without

disassembling the rest of the casing or removing the shaft. Accordingly, segmentation of the seal does not inherently lead to retractability.

Further, the retractability of the seal is not for accommodating thermal expansion, it is because during start-up and shut down there are vibration modes in the shaft that, if the seal were at normal clearance, would damage the fins on the seal (thereby requiring it to be replaced sooner and decreasing the turbine efficiency in the meanwhile) (see ¶¶ 12-13 of Shifler declaration previously submitted and discussed in prior response, the discussion of which is incorporated herein by reference). Moreover, the Examiner's supposition that segmentation would accommodate thermal expansion is incorrect: because thermal expansion is a linear effect ($\Delta L = C_p \cdot \Delta T$) and the circumference of the seal is a fixed length (a circle of a given diameter), if the seal were heated that much it would buckle (expansion of the material would require a circle of a larger diameter). Further, heating the seal would cause expansion in the radial direction both inwardly and outwardly (and inward expansion would be detrimental to the inner sealing face).

Most importantly, the upper T-shaped extension on the Bagepalli device overlaps (is circumferentially displaced from) the lower portion with the inner face. Portion 26 of an adjacent segment would reside with end 58 abutting end 56, and this abutment is disposed, in part, under element 30 (where number 32 is shown). The abutting segment could not move radially outward (a necessary requirement for a "retractable" seal) because of the overlying portion of element 30. This rejection should now be withdrawn.

Obviousness rejection under 35 USC 103

The rejection hereunder over the combination of Bagepalli and Brandon is respectfully traversed.

As noted above, there is no teaching, suggestion, or indication that Bagepalli contemplates a retractable seal. In fact, because of the interlocking nature of the abutting segments (as just explained) they cannot move radially outward, and so Bagepalli actually teaches away from Brandon and the present invention because that seal design cannot be retractable.

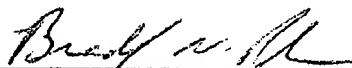
The Advisory Action alleges that Hemsley (GB 2 301 635 A) discloses a retractable seal, which is incorrect; note page 3, lines 9-12, wherein the keyway 14 engages the head formation 17 "thus trapping the body member in position"; clearly, being trapped is not being retractable.

The previously-submitted Shiffler declaration explains that there are design considerations for maintaining the retractability of a seal like Brandon's if a brush were to be added as a sealing element. Bagepalli does not address these considerations because the Bagepalli seal cannot be retracted. Accordingly, any proper combination of these references cannot render obvious the claimed retractable seal, and so the present rejection should now be withdrawn.

Conclusion

In light of the foregoing amendments and remarks, withdrawal of all the rejections, and further and favorable action, in the form of a Notice of Allowance, are now believed to be in order, and such actions are earnestly solicited.

Respectfully submitted,



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APPENDIX OF MARK-UPS OF AMENDMENTS

1. (Twice amended.) A retractable packing segment for an apparatus that extracts work from the expansion of a gaseous working fluid, said apparatus comprising:

a rotating shaft disposed in a casing,

a plurality of [said] packing segments disposed in a ring [formed from a plurality of packing segments] and centered on an axis defined by said shaft to provide a seal therearound,

said retractable packing segment comprising:

an inner face for sealing against said shaft[;] and an outer face supporting a T-shaped extension, said inner and outer faces and said extension spanning opposing side ends, said side ends cut parallel with radii of said axis; and

at least one brush seal disposed on the inner face of said segment [opposing ends of said segment cut parallel with radii of said axis; and], said brush seal having opposing ends, at least one of said ends cut non-parallel with radii of said axis.

6. (Twice Amended.) A retractable brush seal for an apparatus that extracts work from the expansion of a gaseous working fluid, said apparatus comprising:

a rotating shaft disposed in a casing,

said brush seal in the geometry of a ring formed from a plurality of adjacent abutting packing segments and centered on an axis defined by said shaft to provide a brush seal therearound,

each said segment comprising:

an innerface for sealing against said shaft and an outer face supporting a T-shaped extension, said inner and outer faces and said extension spanning opposing side ends, said side ends cut parallel with radii of said axis; and;

at least one brush seal disposed on the inner face of said segment[;].
[opposing ends of said segment cut parallel with radii of said axis;] said brush seal having opposing side ends cut non-parallel with radii of said axis, one of said side ends cut angled to form a tongue extending past the segment side end and the other of said brush seal ends cut at the same angle relative to said segment to provide a groove for accepting a tongue formed by a brush seal on [another] an adjacent packing segment.